



Perceived Impediments and Anticipated Solutions to HR (Human Resource) Towards Implementing Industry 4.0 in SMEs: Impediments and Anticipated Solutions to HR

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ABSTRACT

The study aims to evaluate perceived impediments and anticipated solutions to HR while implementing Industry 4.0 initiatives in SMEs. A group of 10 decision-makers from these SMEs was tasked with assigning ratings to a variety of parameters. To create the model for 10 perceived impediments and five anticipated solutions and subsequently rank them, the TOPSIS technique is employed. According to the data analysis, job reductions, unemployment, and job uncertainty have emerged as the top three significant hurdles, while challenges to trainers, replacement of humans, and training costs have been recognized as the bottom three. Smart HR 4.0 and AI & Data Analytics are the top and lowest-ranked solutions respectively. HR in I4.0 in SMEs parameters have been graded based on their contributing attributes. However, it is also true that there are several impediments associated with the implementation of Industry 4.0. These impediments become more challenging in the context of SMEs.

KEYWORDS

Anticipated Solutions, Human Resource (HR), Industry 4.0, Perceived Impediments, Smart Human Resource 4.0

1. INTRODUCTION

Industries are the core of the economy for any country and hence the industrial development is needed with the help of technological development (Sharma & Kushwaha, 2017; Horvath & Szabo, 2019). Industrial development takes place on a periodical basis as per the changes in technology and the demand of the consumers. So far, the industries have experienced various waves of industrial

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revolutions towards the development and growth of the manufacturing sector (Lasi et al., 2014; Lim et al., 2021). In the current industrial scenario, industry 4.0 is widely discussed among industrialists and consumers. Industry 4.0 is also understood as the industrial revolution, which is presently implemented by industries in almost every sector across the world conclude specifically nations engaged with industrial development (Anshari et al., 2021). The origin of the concept took place in a program held in Germany and after that widely accepted by other nations (Kagermann et al., 2011). The concept of industry 4.0 is about the integration of technology-intensive systems with the use of internet technologies such as cyber-physical systems used for manufacturing (Dafflon et al., 2021). The terminologies and technologies used in the concept of industry 4.0 are the internet of things (IoT), industrial internet of things (IIoT), 3D printing (additive manufacturing), robotics technologies, artificial intelligence (AI), cyber-physical systems (CPS), and other high-end technologies based on the networking systems (Zheng et al., 2021). The use of the internet (IoT) has provided promising results to the industries in all the departments of engineering, manufacturing, inventory management, and supply chain management (Yadav et al., 2020a; Ivanov et al., 2021). These systems enhance the manufacturing process in an unprecedented way that not only gives an advantage to the firm but also to the customers who get the product as per their demand within time. Horvath & Szabo (2019) have had cited several definitions of industry 4.0 that conclude the strong nexus among the various elements of the manufacturing process and the elements of the stakeholders with high-end technologies (IoT, CPS, etc.) towards making a win-win situation to all. There are various significant components in industry 4.0 these are human-machine connections, digitalization, value additions, optimization, and product customization, data sharing and communication, and automation and adaption (Roblek et al., 2016). Industry 4.0 was found useful for the industries and the stakeholders in several ways. The successful implementation of technologies associated with industry 4.0 such as big data analytics and cloud computing leads to lean production, competitive advantage, cost reduction, sustainability (environmental, economic, and social), upskilling of employees, etc. (Kamble et al. 2018; Yadav et al., 2020b). It has been researched and found so far that digitalization always has had given a new edge to the firms in developing and expanding the business. Moreover, digital technologies are becoming the most essential part of the business ecosystem and the success of the firm is mainly led by these digital technologies (Bag et al., 2018). The increasing expansion of industry 4.0 with digitalization is enhancing the entire value chain that benefits the customer and makes the value chain sustainable towards gaining the competitive advantage of the firm. The companies who are predicting the advantages of industry 4.0 are putting their best effort to implement these practices in their organizations to ensure the long-term benefits (Bauer et al., 2015; Bag et al., 2020a). The big-size companies are continuously working to implement industry 4.0 so that they can gain a comparative advantage and win over their competitors (Lasi et al., 2014).

The advantages and benefits of industry 4.0 are many but, certain impediments hinder the path of industry 4.0. These impediments are of more concern when it comes to SMEs because of their limited resources specifically financial constraints (Mittal et al., 2018). There is much research available upon industry 4.0 those who have had focused much on barriers and opportunities of industry 4.0. The studies were conducted by several authors (Sivathanu & Pillai, 2018; Horvath & Szabo, 2019; Rana & Sharma, 2019; Masood & Sonntag, 2020; Stentoft et al., 2020; Cugno et al., 2021), who have had highlighted various barriers or impediments in different sectors. These authors have also raised the issues related to the human resource (HR) capabilities, limitations, and exploitations while dealing with the industry 4.0 adoptions. However, these studies have had not much focused on the perceived impediments and their anticipated solutions, which are desirous for the industrialists who are looking for the adoption and implementation of industry 4.0. On the other hand, there is limited research available, which specifically focuses on SMEs and HR impediments with solutions. Moreover, the majority of the research published in context to industry 4.0 highlights much on general industries and there are fewer studies that have had highlighted the issues of SMEs towards implementing industry 4.0. In this way, the present study gets the dual motivation to fill both the main gaps of the study

and bring the novelty in this specific area of research. Therefore, the entire focus has been given to the impediments, which are hindering the performance of SMEs and their solutions specifically in the context of HR. The present study is also significant because a study (Horvath & Szabo, 2019) suggests that the biggest impediments in the industry 4.0 for the SMEs are managing HR. Here, it is also imperative to note, to understand the significance of the present study that, SMEs are the backbone for most of the developed and developing economies in the European Union and Asian countries. It is also true that most of the manufacturing work is carried out by SMEs around the world. Therefore, when it comes to discussion about industry 4.0 it is not a justice to exclude the issues concerned to the SMEs. In the present study, the entire focus has been given on SMEs and HR issues related to industry 4.0.

The study identifies several research questions, which need to be answered with the help of the present study these are:

RQ1: What are the perceived impediments to HR if implemented industry 4.0?

RQ2: What are the anticipated solutions to HR impediments in context to industry 4.0?

RQ3: Which is the most relevant among the perceived impediments and anticipated solutions?

RQ4: How to make SMEs capable of implementing industry 4.0?

The above research questions are solved in the study with the help of achieving the following objectives of the study these are:

1. To identify HR impediments that hinder the successful implementation of industry 4.0.
2. To identify HR solutions towards successful implementation of industry 4.0.
3. To rank all the above impediments and solutions.
4. To make suggestions for SMEs towards implementing industry 4.0 as per the results of the study.

To accomplish the objective of the study number of research were thoroughly studied and variables were identified for the present study. The analysis was performed with Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The study was performed on the key managers/ leaders/owners of their respective SMEs in India. A semi-structured questionnaire was prepared targeting experts associated with SMEs. These SMEs are yet not have implemented the concept of industry 4.0 and are preparing for its implementations. Based on the results, several recommendations were suggested in the study.

The study is structured into several key headings and sub-headings. After the introduction part, the main key heading of the study is “literature review “where several studies are presented in various sub-headings. In the next section, the key heading is “research methodology” where the main methodologies of the study and data are discussed; this section is ended with the “data analysis and results”. The final part of the study starts with the “discussion and conclusions” followed by “managerial and social implications”. The research ends with the “future research scope and limitations” of the study.

2. LITERATURE REVIEW

In the study, several research papers published in reputed international journals were identified with the help of “*google scholar*”. The research articles published in the last five years in the reputed international journals (indexed in Scopus, web of science, and other reputed indices) were only picked for the study. The search strings while searching the research articles were used as “industry 4.0 and SMEs”, “industry 4.0 and challenges”, “human resource challenges and industry 4.0”. In this process, seventy-two articles were finalized that were close to the objective of the present study. The

imperative objective of the literature review section was to identify key variables for the study. All these research papers were studied and represented in the literature review section.

2.1 Industry 4.0 Genesis and the Concept

Industry 4.0 initially emerged from Germany within the industrial civilization which was initiated by Kagermann et al. (2011) where they started the concept with smart manufacturing. The study conducted by Möller (2016) cited that the concept of industry 4.0 was used first time in the year 2011 in a German fair named '*Hannover Fair*' which was organized for industrial development by the German government (Yüksel, 2020). The successful implementation of the concept of industry 4.0 later, the concept got widely accepted across the globe specifically in European and Asian countries. (Gilchrist, 2016). The prime role of industry 4.0 is converting all the manufacturing into the digitalized facility, which can be connected with man and machines equally for the better output of the production both in terms of quality and quantity (Nardo et al., 2020). Therefore, industry 4.0 is widely accepted and used and those who have not implemented so far are initiating it (Cugno et al., 2021). The concept of industry 4.0 is also viewed as an industrial revolution that was due after the third industrial revolution 20th century. There is a vast development between the first industrial revolution (which started in the 18th century) and the fourth revolution i.e. industry 4.0 (Horvath & Szabo, 2019). There was a time when machines were used to power with water and steam and today they run on voice commands. The industry 4.0 concept involves technologies such as autonomous robots, simulations, IoT, CPS, additive manufacturing, machine learning and augmented reality which makes the industries smart (Valenduc & Vendramin, 2016; Moktadir et al., 2018). The industry 4.0 concept is also viewed as the application of information technology and electronics systems (Ghobakhloo, 2018). Whereas, Lee et al., (2018) advocated that industry 4.0 is the expansion of information technology (IT). Industry 4.0 emerged with the new methods and techniques of manufacturing products based on communication technologies, machine learnings, and robotics technologies (Valenduc & Vendramin, 2016). Four key elements are discussed commonly in the context of industry 4.0 these are CPS, IoT, smart factories, and other internet-based technologies (Hermann et al., 2016). The CPS is made of smart machines, which consist of warehousing systems and manufacturing facilities that are developed with digital features with ICT integration. CPS is the most important terminology used and applied in the context of industry 4.0. There are several big organizations (Netflix, Amazon, & Google, etc.) that are engaged in implementing industry 4.0 and using big data analytics for decision-making based on customer choice (Zhong et al., 2017). There are many other manufacturing sectors such as pharmaceutical, automobile sector, chemical manufacturing firms that used digital technologies and make their supply chain effective (Moktadir et al., 2018).

2.2 Industry 4.0 Needs and Benefits

The implementation decision of industry 4.0 is completely based on its need and benefits to the industries. These benefits can be achieved by implementing industry 4.0 and these benefits are organizational, operational benefits, environmental benefits, and social benefits (Scremin et al., 2021). There is a need of implementing industry 4.0 but this need can be realized by those companies who have already studied its needs and benefits (Gilchrist, 2016). However, studies highlight the benefits which are extremely important for any firm working in the manufacturing area. The studies conducted in the area of industry 4.0 show various benefits that are practical and theoretical (Yüksel, 2020). The increasing demand of the customers and competitiveness encourage companies to enhance their manufacturing skills and technologies (Chen et al., 2020). These technological adoption and innovative methods are important for any company to compete in the longer run. Industry 4.0 gives companies the advantage of catering to the customized demand of the market efficiently with the help of advanced technologies used in industry 4.0 (Leng et al., 2021). In recent research and development, it is found that the advanced technologies used in industry 4.0 are not only helpful for the organization in gaining profit but also it is important for sustainability in the end (Bai et al., 2020). Therefore, it is

advocated towards its implementation by many firms and researchers and in recent scenarios, industry 4.0 has received massive attention among the manufacturing organizations (Dalenogare et al., 2018).

2.3 Impediments to Industry 4.0

Industry 4.0 is taking place in several organizations and many of them are planning to implement it. But, there are certain hurdles (technological, organizational, and managerial) explored in the existing research towards making it a big success. On the other hand, industry 4.0 is needed heavy investment and there is a lack of clarity among the firms and because of it, several firms refrain from adopting industry 4.0 in their organizations (Yuksel, 2020). Legal and uncertainties related to contracts found the most significant barriers found in the study and this barrier affects the other associated barriers (Kamble et al., 2018). The other two most critical impediments to industry 4.0 found in the study based on the interview were complexities increasing in the production process cross-organizational networks (Hofmann & Rusch, 2017). There are several issues related to the workforce as the majority of the workforce is not aware of the technological concept of industry 4.0 and the technologies, which are emerging in the current industrial scenario (Kumar et al., 2021). Many companies are over conscious about their investments and finances in this case they fear risk-taking and investing in novel concepts like industry 4.0 (Kamble et al., 2018). Raj et al., (2020) have identified several barriers associated with the implementation of industry 4.0 these are related to investment risk, clarity to the organization towards the benefits, problems related to value chain integration, security risk, lack of technical knowledge, lack of skilled workforce and lack of appropriate regulations and certifications, lack of the desired infrastructure. Organizational resistance specifically from the employees' side and from the middle management group is also among the key impediments towards implementing industry 4.0 (Machado et al., 2019). Many authors have also suggested that lack of skilled manpower and several other conflicts within the organization also hinders the adoption of new technologies in the organization (Kiel et al., 2017). These identified barriers affect other barriers and create a problem for adopting industry 4.0. and lack of education system is the key also found a key barrier that hinders the growth of industry 4.0 in industries (Karadayi-Usta, 2019). There are also challenges related to the location and geography of the industries and it is suggested to check these issues before implementing the concept of industry 4.0 (Horvath & Szabo, 2019; Raj et al., 2020). Luthra & Mangla (2018a) have also identified a few barriers which are lack of competency, poor data quality, lack of integration, lack of coordination and collaboration, security-related issues, weak government policies towards supporting it, and other financial constraints. There are also suggestions (Kamble et al., 2018; Horvath & Szabo, 2019) that there is a need for more exploration and investigation regarding the implementation of industry 4.0 and its barriers. These, need to be investigated in context to developing and developed countries with their differences.

2.4 SMEs Approach Towards Adopting Industry 4.0

The SMEs are the backbone for most of the economy around the world as the maximum manufacturing part is taken care of by them (Masood & Sonntag, 2020). SMEs contribute to the growth of industries in all the developing economies worldwide hence, it is important to keep upgrading to this sector with new technologies (Singh & Kumar, 2020). The SMEs that have established internal and external systems with stronger social capital and management support have higher tendencies to adopt industry 4.0 in their organizations (Agostini & Nosella, 2019). Though, SMEs are having more constraints in adopting the technologies of industry 4.0 (Stentoft et al., 2020). These small companies are struggling with investment capabilities which is a major problem in the adoption of innovative technologies such as industry 4.0 (Khanzode et al., 2021). The SMEs are major works as a supplier for the big organizations and hence they got affected if there is a technological mismatch between these two parties and it is the reason that these SMEs show their interest in adopting novel technologies (Cimini et al., 2020). The adoption factors for SMEs for industry 4.0 management support and leadership are significant rather than innovativeness and other compatibility factors (Sriram & Vinodh, 2020).

The SMEs also do not have a better understanding of industry 4.0 and digital manufacturing, which is also among the hurdle in adopting the technology. (Pirola et al., 2019). SMEs are indeed suffering from various challenges related to finance, HR, and leadership and they are less prepared than the bigger organizations towards adopting industry 4.0. (Dalenogare et al., 2018).

2.5 Impediments and Solutions to HR Towards Adoption of Industry 4.0

The adoption of industry 4.0 in the SMEs setup is facing several impediments and apart from the financial impediments, there are major impediments that are connected to human resource management (HRM). Research findings indicated that among all the significant resources HR is also one of the most important resources for the adoption of industry 4.0, without which it is not possible to implement industry 4.0 in the system (Bag et al., 2021). It is studied that the workforce in some of the countries resists the adoption of industry 4.0 because of the threat of approximately 25 percent job reductions (Segal, 2018). There are also discussions that more of the tasks done by humans will be replaced by advanced machines (Horvath & Szabo, 2019). The employees do not find themselves compatible with their skills with the new changes and hence there is a fear of job loss (Grube et al., 2019). Employers also face several challenges related to re-skilling employees because it takes time and investment (Kumar et al., 2021). Increasing job insecurity and unemployment are also some of the major threats to HR in the context of industry 4.0 (Luthra & Mangla, 2018a; Agarwal et al., 2021). To cope up with the current technologies the employees need training with the advanced platform of industry 4.0 and this cost the company a huge investment, on the other hand, there is also a requirement of trained trainer for providing better training (Muller, 2018; Agarwal et al., 2021). The perception of the experts suggests that there is a mismatch between the speed of the organizational change with industry 4.0 and the present skills or capabilities of the existing employees (Whysall et al., 2019). There is a lack of knowledge among the people in the organization who can understand better the technological complexities of industry 4.0 (Turkes et al., 2019). The changes in the organization setup caused by the implementation of industry 4.0 there are several challenges related to hiring skilled manpower and other HRM issues (Hameed et al., 2020). Compared to the big organizations' small organizations have mainly two problems towards adopting industry 4.0 which is associated to finance and HR (Stentoft et al., 2019). The advanced manufacturing technologies used in industry 4.0 require more skilled HR who can handle the work effectively. But, there are challenges towards the skill sets among the employees (Muller, 2018; Yuksel, 2020).

To adopt the concept of industry 4.0, SMEs need to provide more information and training to their employees (Sari & Santoso, 2020). Recent studies have shown several solutions to these problems of HR such as providing better training to the staff as per organizational development (Adolph et al., 2014; Yuksel, 2020). There is a need among the people working in the organization that the adoption of industry 4.0 practices will also enhance human safety in the organization as major risky works will be handled by fully automated machines (Moktadir et al., 2018). The impediments are associated with HR while implementing industry 4.0 and it can also be reduced by arranging events related to knowledge sharing in the organization (Sriram & Vinodh, 2021). The development of HR can be enhanced with the adoption of technology used in industry 4.0 such as artificial intelligence (AI) and data analytics (Ghobakhloo, 2020). They are authors who advocated that there is a need for a specially dedicated team of "Smart HR4.0" which will handle and manage all the HR-related problems associated with industry 4.0 (Sivathanu & Pillai, 2018; Rana & Sharma, 2019).

Table-1 provides a list of identified variables for the study. There are two key variables identified the first one is about the perceived impediments to HR towards implementing industry 4.0. The second main variable is about the anticipated solutions to the impediments to HR towards implementing industry 4.0 in SMEs. These parameters were identified from the literature review.

Table 1. List of identified variables for the study

SN	Perceived Impediments to HR (PIHR)	Source
1	Job Reductions	Brühl, 2015; Horvath & Szabo, 2019
2	Replacement of human	Horvath & Szabo, 2019
3	Lack of skilled workforce	Müller & Voigt 2017; Kiel et al., 2017; Moraliyska et al., 2018; Müller, 2018; Yüksel, 2020
4	Low knowledge	Moktadir et al., 2018; Turkes et al., 2019
5	Training Cost	Müller, 2018
6	Challenges of Re-skilling	Kumar et al., 2021
7	Employee Resistance	Horvath & Szabo, 2019; Bag et al., 2020b
8	Unemployment	Luthra & Mangla, 2018a
9	Job insecurity	Agarwal et al., 2021
10	Challenges to trainers	Agarwal et al., 2021
SN	Anticipated Solutions to HR (ASHR)	Source
1	Employee training	Adolph et al., 2014; Yüksel, 2020
2	Awareness about industry 4.0	Moktadir et al., 2018
3	AI and Data Analytics	Ghobakhloo, 2020
4	Smart HR 4.0	Sivathanu & Pillai, 2018; Rana & Sharma, 2019
5	Knowledge Sharing Events	Sriram & Vinodh, 2021

2.6 Research Gap

The adoption of industry 4.0 and its impact on business performance has received a significant amount of attention among researchers worldwide (Sari et al., 2020). But, it is still the fact there is still a wide scope of research in the area of industry 4.0 as there is still a research gap that needs to be filled with upcoming research (Rauchet et al., 2018; Horvath & Szabo, 2019). The thorough review of literature based on the concept of industry 4.0 and its implementation in SMEs has shown a few research gaps which are:

1. There is a lack of research that highlights the impediments to HR in context to SMEs and industry 4.0 implementation.
2. The study has also marked a research gap in highlighting the HR solutions to impediments.
3. There is a lack of studies that prioritize these HR-specific impediments and solutions in one study.
4. some studies highlight overall impediments but no studies have been made so far highlighting HR-specific impediments and solutions with managerial perspectives.
5. There is still a lack of studies in the area of industry 4.0 in context to SMEs.

3. RESEARCH METHODOLOGY

3.1 Data Collection

The present research of the case study method highlights the most significant impediments and solutions to HR in implementing industry 4.0. In the study, the data has been collected from the key 'decision makers' (DMs) of the SMEs operating in central India and the capital of the country (New

Delhi). These key DMs are responsible for taking strategic decisions for the company that includes staffing and other organizational-level decisions including production decisions. These DMs are experienced in their respective field of expertise in India. The work experience of these DMs was above ten years. Before, taking the interview of these DMs the prior appointment was taken. Later, the questionnaire was mailed to these DMs and contacted on the telephone to make them understand the study and the questionnaire. Based on previous literature, this sample size with ten experts is satisfactory and considered for data collection and the final analysis (Mangla et al., 2016; Luthra & Mangla, 2018b; Kumar et al., 2020; Do et al., 2020; Sharma et al., 2021; Pathak et al., 2020; Verma et al., 2021). Initially, we contacted fifteen experts from selected SMEs but only ten agreed to participate in this study. After collecting their most pertinent responses from these experts, discussed with them in the context of previous literature. All variables with high mean values were considered for the analysis (Luthra & Mangla, 2018b). Moreover, the data provided by these respondents has been treated confidential and used only for academic purposes, not for commercial purposes. Nowhere their name and personal identity were revealed so, we measured only relevant information. These respondents were contacted using convenience sampling to provide their opinions because they are from industry and academics. Further, to avoid biasness, no direct questions were asked, thus the performance and personal growth will not be affected by any kind of biasness. The items/questionnaire, measured on a 5-point Likert scale were considered (Podsakoff et al., 2003; Podsakoff et al., 2012; Luthra & Mangla, 2018b). The sampling technique led to a designated sample size to avoid the biases of the sampling (Luthra & Mangla, 2018b). Thus, we checked the examined the method biases and then make a decision (Podsakoff et al., 2003; Podsakoff et al. 2012). They have been explained about the concept of industry 4.0 and the purpose of the study so that they can successfully participate in the study. In this way, two artificial alternatives are hypothesized:

- P₁**: Top ranking perceived impediments to HR towards industry 4.0 have the worst level and need to avoid first while opposite on bottom.
- P₂**: Top anticipated solutions to HR towards industry 4.0 have the best level values while opposite on bottom.

Table 2 gives brief information about the company profile of the selected DMs in the study.

After collecting responses, we have considered these ten decision-makers for the evaluation of ten impediments. These are Job Reductions (PIHR1), Replacement of human (PIHR2), Lack of skilled workforce (PIHR3), Low knowledge (PIHR4), Training Cost (PIHR5), Challenges of Re-skilling (PIHR6), Employee Resistance (PIHR7), Unemployment (PIHR8), Job insecurity (PIHR9), and Challenges to trainers (PIHR10). The anticipated solutions are Employee training (ASHR1), Awareness about industry 4.0 (ASHR2), AI and Data Analytics (ASHR3), Smart HR 4.0 (ASHR4), and Knowledge Sharing Events (ASHR5). It has been constructed accordingly. Further, we have followed the research process of the study step by step. Figure 1 represents the flowchart of the proposed research work of the current study.

3.2 TOPSIS Method

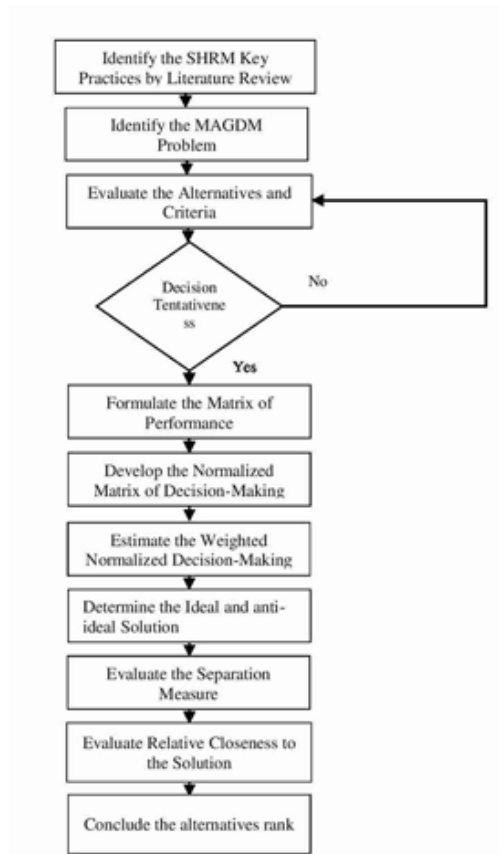
The method called TOPSIS is an MCDAM (multi-criteria decision analysis method) which was first developed by Hwang & Yoon (1981) and further developed by Yoon (1987) and Hwang et al. (1993). It was first introduced by Chen (2000) to solve the MCDM problems under uncertainty and vagueness situations. Several researchers now employ the TOPSIS approach to prioritize data (Singh et al., 2016). The eleven criteria have been evaluated as parameters, and five DMs have been enlisted as decision-makers to make practical recommendations to this industry. Furthermore, the TOPSIS approach is immediately used to this topic to deal with unstructured situations. Before utilizing the TOPSIS approach, we double-checked its assumptions, which include the linkages between many dependent and independent elements. TOPSIS approach was used by Wang & Lee (2009), Singh

Table 2. Demographic details of the decision-makers

Profile	Classification	Count
Respondents	Male	10
	Female	0
	Total	10
Type of industry	Manufacturing sector	10
	Service sector	0
	Total	10
Age	25-35 years	2
	36-45 years	5
	46-55 years	2
	Above 55 years	1
	Total	10
Work experience	0-5 years	1
	6-10 years	3
	11-15 years	3
	16 and above years	3
	Total	10
Designation of the respondents	Manager	1
	Supervisor	2
	Senior manager	6
	Executive	1
	Total	10
Education	Bachelors	8
	Post Graduate and above	2
	Total	10
Department of respondents	Operations Management	1
	Production Management	2
	Product Quality Department	3
	R&D	1
	Sales and Marketing	2
	HR	1
	Total	10

et al. (2016), and Do et al. (2020) to prioritize the parameters using an expert-based method with three, five, or ten experts, and these researchers did not consider assessing the redundancy in their research. For our study, we considered five experts in an identical circumstance. Bulgurcu (2012) identified the TOPSIS approach for selecting the best alternative, which is based on the rank of alternatives. This is the closest alternative to the ideal solution, and it provides the finest alternative with the least anti-ideal solution. Bulgurcu (2012) identified the TOPSIS approach for selecting the

Figure 1. Flowchart of the proposed research work (*MAGDM: multi-attribute group decision making)



best alternative, which is based on the rank of alternatives. This is the closest alternative to the ideal solution, and it provides the finest alternative with the least anti-ideal solution. Furthermore, this method is used to compare, calculate, and compute relative performance to determine which is the best. However, utilizing the TOPSIS approach, the eleven factors are measured and rated in their units, where everything reflects the appropriate direction of the garment industry in India to optimize profit and productivity. Only crisp (binary) and static values are considered in the traditional TOPSIS technique. The decision-makers in this strategy employ language variables to measure the criteria in this case. It is depicted in Table 3.

Table 3. Linguistic code for evaluating criteria

Linguistic scale	Symbol	Score
Un-important	UI	1
Slightly-Important	SI	2
Fairly-Important	FI	3
Important	I	4
Very-Important	VI	5

The extent following steps is included in the TOPSIS method. Hwang & Yoon (1981); Hwang et al. (1993); Wang & Lee (2009), Bulgurcu (2012); Singh et al. (2016), and Do et al. (2020) have considered each step in their studies.

Step 1: A MAGDM (multi-attribute group decision making) problem can be concisely expressed in matrix format as $[x_{ij}]_{m \times n}$ based on m alternative and n criteria having a rating of i th DMs and j th criteria.

The decision matrix is expressed as:

$$\begin{matrix}
 & C_1 & C_2 & \cdot & \cdot & \cdot & C_n \\
 A_1 & X_{11} & X_{12} & \cdot & \cdot & \cdot & X_{1n} \\
 A_2 & X_{21} & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 A_m & \cdot & \cdot & \cdot & \cdot & \cdot & X_{mn}
 \end{matrix}$$

$$r_{ij} \in [0, 1]$$

where number of alternative $i = 1, 2, \dots, m$ and number of criteria $j = 1, 2, \dots, n$

Step 2: The normalized decision matrix has been developed considering equation (1). It has been made such that, all the data set is equal measuring criteria in a single platform for normalization of the matrix.

We then obtain the normalized decision matrix (denoted by R):

$$\begin{matrix}
 r_{11} & r_{12} & \cdot & \cdot & \cdot & r_{1n} \\
 r_{21} & r_{22} & \cdot & \cdot & \cdot & r_{2n} \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 r_{m1} & r_{m2} & \cdot & \cdot & \cdot & r_{mn}
 \end{matrix}$$

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^n x_{ij}^2}} \tag{1}$$

where $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$.

Step 3: Construct the weighted normalized matrix, denoted as:

$$\begin{matrix}
 v_{11} & v_{12} & \cdot & \cdot & \cdot & v_{1n} \\
 v_{21} & v_{22} & \cdot & \cdot & \cdot & v_{2n} \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
 v_{m1} & v_{m2} & \cdot & \cdot & \cdot & v_{mn} \\
 v_{ij} = w_j * r_{ij}
 \end{matrix} \tag{2}$$

where $i=1 \dots n$; $j=1 \dots m$; and w_j = weights of different attributes.

Step 4: We determine the ideal solution using equations (3) to (6). The ideal solution is not achievable so, we maximize each objective and each criterion individually. We get value, make a group of it and try to achieve that value and we then minimize the distance, the decision, and this ideal solution having a maximum value:

$$A^+ = (v_1^+, v_2^+, \dots, v_n^+) = \text{The ideal solution} \tag{3}$$

$$v_j^+ = \{ \max_i v_{ij}, \min_i v_{ij} \} \text{ BA = Benefit attribute} \tag{4}$$

$j \in B.A., j \in C.A.$

$$A^- = (v_1^-, v_2^-, \dots, v_n^-) = \text{Negative or anti ideal solution} \tag{5}$$

$$v_j^- = \{ \min_i v_{ij}, \max_i v_{ij} \} \text{ BA = Benefit attribute} \tag{6}$$

$j \in B.A., j \in C.A.$

Step 5: The next step measures the distance of each alternative measured by the Euclidean distance from the positive and negative ideal solutions using equations (7) and (8). The Euclidean distance between two TFNs $A_1(a_1, b_1, c_1)$ and $A_2(a_2, b_2, c_2)$ is calculated by:

$$d_i^+ = \sqrt{\sum_j (v_{ij}^+ - v_j^+)^2} \tag{7}$$

$$d_i^- = \sqrt{\sum_j (v_{ij}^- - v_j^-)^2} \tag{8}$$

where $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$.

Step 6: The closeness coefficient CC_i of the alternative is calculated using equation (9):

$$CC_i = \frac{d_i^-}{d_i^- + d_i^+}, i = 1, 2, \dots, m \quad (9)$$

Step 7: The closeness coefficient CC_i depicts the best solution if it is closest to 1 and determines the rank of alternative. The best alternative has the shortest distance to the ideal solution and this shortest distance depicts the longest distance from the negative ideal solution.

4. DATA ANALYSIS AND RESULTS

4.1 Perceived Impediments to HR Towards Industry 4.0

10 DMs belong to high management and help existing industries rank their best practices for the topic addressed in this study report. We chose 10 barriers and five potential remedies linked to HR from the literature. We next used the TOPSIS approach to create models to rank the parameters. This section walks you through the steps of running the TOPSIS model. Based on the experience all decision-makers have given weightage of “0.15”, “0.1”, “0.1”, “0.2”, “0.2”, “0.03”, “0.15”, “0.03”, “0.02”, and “0.02” respectively. As a linguistic code for evaluating factors presented in Table 3, these criteria are graded on a scale of 1-5 (1-unimportant, 5-very important). These decision matrix scores and weight points are identified (described in Table 4) based on the literature review and expert comments, and the normalized values of a decision matrix are obtained (given in table 5). We created a weighted normalized decision matrix using steps 2 and 3, as shown in Table 6. We derive the positive and negative ideal solutions using the TOPSIS model in step 4, as shown in Table 7. We determine the separation of each parameter from the positive and negative ideal solutions using step 5, as illustrated in tables 8 and 9. The relative proximity of each parameter to the ideal solution (closeness ratio) was determined using the next step 6, and it was reported in Table 10 based on the closeness ratio (using step 7). The relative ranking of these factors, as well as their performance, were determined and are depicted in Table 10 and Figure 3 accordingly. The TOPSIS method is expressed in the following phases in order of execution.

The final rank is PIHR1 > PIHR8 > PIHR9 > PIHR7 > PIHR3 > PIHR4 > PIHR6 > PIHR10 > PIHR2 > PIHR5. From Table 10, we see that PIHR1 has the highest CC_i score of 0.97994 while PIHR5 has the lowest CC_i 0.01844. Based on the CC_i scores, the graph is plotted in Figure 3 which represents the impediments rank of SMEs. We found the top and bottom three parameters after analyzing the data. Based on data analysis, Job reductions, unemployment, and job uncertainty have emerged as the top three key parameters with high closeness coefficients as “0.97994”, “0.89304”, and “0.78959” respectively. Whereas, the Challenges to trainers, Replacement of human, and Training costs are identified as the bottom three with their closeness coefficients as “0.23353”, “0.09554”, and “0.01844” respectively.

4.2 Anticipated Solutions to HR Towards Industry 4.0

Similarly, we have identified anticipated solutions and measured them to overcome the perceived impediments using the same technique. Tables 11 to 17 follow the TOPSIS methods and represent the solutions while Figure 3 shows the rank of the anticipated solutions. The final rank of these solutions is ASHR4 > ASHR5 > ASHR1 > ASHR2 > ASHR3. From Table 17, we see that Smart HR 4.0, Knowledge Sharing Events, Employee training, Awareness about industry 4.0, AI, and Data Analytics have emerged as top to bottom solutions rank of SMEs with closeness coefficients as “0.83674”, “0.83491”, “0.24935”, “0.13436”, and “0.000” respectively.

Table 4. The scores of the decision matrix and weight from different DMs' suggestion

SN	Weight	0.15	0.1	0.1	0.2	0.2	0.03	0.15	0.03	0.02	0.02
	Perceived Impediments (PI)	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	Job Reductions (PIHR1)	5	5	4	5	4	5	5	5	5	3
2	Replacement of human (PIHR2)	5	4	4	3	2	4	4	4	4	2
3	Lack of skilled workforce (PIHR3)	5	3	5	4	3	4	4	3	5	4
4	Low knowledge (PIHR4)	5	3	4	4	3	4	3	3	5	3
5	Training Cost (PIHR5)	5	3	4	3	2	3	3	2	5	2
6	Challenges of Re-skilling (PIHR6)	5	3	5	4	2	3	5	5	5	3
7	Employee Resistance (PIHR7)	5	4	4	5	3	3	5	3	5	4
8	Unemployment (PIHR8)	5	3	4	5	4	4	5	4	4	5
9	Job insecurity (PIHR9)	5	4	3	4	4	2	5	4	4	2
10	Challenges to trainers (PIHR10)	5	3	4	3	3	2	4	3	4	3

Table 5. Normalized values of decision matrix

SN	PI	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	PIHR1	0.316228	0.443678	0.305888	0.388075	0.408248	0.449013	0.361787	0.425628	0.341793	0.292770
2	PIHR2	0.316228	0.354943	0.305888	0.232845	0.204124	0.359211	0.289430	0.340503	0.273434	0.195180
3	PIHR3	0.316228	0.266207	0.382359	0.310460	0.306186	0.359211	0.289430	0.255377	0.341793	0.390360
4	PIHR4	0.316228	0.266207	0.305888	0.310460	0.306186	0.359211	0.217072	0.255377	0.341793	0.292770
5	PIHR5	0.316228	0.266207	0.305888	0.232845	0.204124	0.269408	0.217072	0.170251	0.341793	0.195180
6	PIHR6	0.316228	0.266207	0.382359	0.310460	0.204124	0.269408	0.361787	0.425628	0.341793	0.292770
7	PIHR7	0.316228	0.354943	0.305888	0.388075	0.306186	0.269408	0.361787	0.255377	0.341793	0.390360
8	PIHR8	0.316228	0.266207	0.305888	0.388075	0.408248	0.359211	0.361787	0.340503	0.273434	0.487950
9	PIHR9	0.316228	0.354943	0.229416	0.310460	0.408248	0.179605	0.361787	0.340503	0.273434	0.195180
10	PIHR10	0.316228	0.266207	0.305888	0.232845	0.306186	0.179605	0.289430	0.255377	0.273434	0.292770

Table 6. Weighted values of decision matrix

SN	PI	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	PIHR1	0.04743	0.04437	0.03059	0.07762	0.08165	0.01347	0.05427	0.01277	0.00684	0.00586
2	PIHR2	0.04743	0.03549	0.03059	0.04657	0.04082	0.01078	0.04341	0.01022	0.00547	0.00390
3	PIHR3	0.04743	0.02662	0.03824	0.06209	0.06124	0.01078	0.04341	0.00766	0.00684	0.00781
4	PIHR4	0.04743	0.02662	0.03059	0.06209	0.06124	0.01078	0.03256	0.00766	0.00684	0.00586
5	PIHR5	0.04743	0.02662	0.03059	0.04657	0.04082	0.00808	0.03256	0.00511	0.00684	0.00390
6	PIHR6	0.04743	0.02662	0.03824	0.06209	0.04082	0.00808	0.05427	0.01277	0.00684	0.00586
7	PIHR7	0.04743	0.03549	0.03059	0.07762	0.06124	0.00808	0.05427	0.00766	0.00684	0.00781
8	PIHR8	0.04743	0.02662	0.03059	0.07762	0.08165	0.01078	0.05427	0.01022	0.00547	0.00976
9	PIHR9	0.04743	0.03549	0.02294	0.06209	0.08165	0.00539	0.05427	0.01022	0.00547	0.00390
10	PIHR10	0.04743	0.02662	0.03059	0.04657	0.06124	0.00539	0.04341	0.00766	0.00547	0.00586

Table 7. Positive and Negative ideal solution

	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
Positive ideal solution	0.04743	0.04437	0.03824	0.07762	0.08165	0.01347	0.05427	0.01277	0.00684	0.00976
Negative ideal solution	0.04743	0.02662	0.02294	0.04657	0.04082	0.00539	0.03256	0.00511	0.00547	0.00390

Table 8. Distance from the positive ideal solution (d_i^+)

SN	PI	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	PIHR1	0.00000	0.00000	-0.00765	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00390
2	PIHR2	0.00000	-0.00888	-0.00765	-0.03105	-0.04083	-0.00269	-0.01086	-0.00255	-0.00137	-0.00586
3	PIHR3	0.00000	-0.01775	0.00000	-0.01553	-0.02041	-0.00269	-0.01086	-0.00511	0.00000	-0.00195
4	PIHR4	0.00000	-0.01775	-0.00765	-0.01553	-0.02041	-0.00269	-0.02171	-0.00511	0.00000	-0.00390
5	PIHR5	0.00000	-0.01775	-0.00765	-0.03105	-0.04083	-0.00539	-0.02171	-0.00766	0.00000	-0.00586
6	PIHR6	0.00000	-0.01775	0.00000	-0.01553	-0.04083	-0.00539	0.00000	0.00000	0.00000	-0.00390
7	PIHR7	0.00000	-0.00888	-0.00765	0.00000	-0.02041	-0.00539	0.00000	-0.00511	0.00000	-0.00195
8	PIHR8	0.00000	-0.01775	-0.00765	0.00000	0.00000	-0.00269	0.00000	-0.00255	-0.00137	0.00000
9	PIHR9	0.00000	-0.00888	-0.01530	-0.01553	0.00000	-0.00808	0.00000	-0.00255	-0.00137	-0.00586
10	PIHR10	0.00000	-0.01775	-0.00765	-0.03105	-0.02041	-0.00808	-0.01086	-0.00511	-0.00137	-0.00390

5. CONCLUSION

The results of the study show that the top three perceived impediments to HR based on their highest CCi score are “reduction in jobs”, “unemployment” and “job insecurity”. As discussed the concept in the study is that industry 4.0 is about making the task with more ease and accuracy with the help of high-end internet-based technologies. These technologies lead to an extreme level of automation in the organization which gives the firm advantage of time and quality in the production. Industry

Table 9. Distance from the negative ideal solution (d_i^-)

SN	PI	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	PIHR1	0.00000	0.01775	0.00765	0.03105	0.04083	0.00808	0.02171	0.00766	0.00137	0.00196
2	PIHR2	0.00000	0.00887	0.00765	0.00000	0.00000	0.00539	0.01085	0.00511	0.00000	0.00000
3	PIHR3	0.00000	0.00000	0.01530	0.01552	0.02042	0.00539	0.01085	0.00255	0.00137	0.00391
4	PIHR4	0.00000	0.00000	0.00765	0.01552	0.02042	0.00539	0.00000	0.00255	0.00137	0.00196
5	PIHR5	0.00000	0.00000	0.00765	0.00000	0.00000	0.00269	0.00000	0.00000	0.00137	0.00000
6	PIHR6	0.00000	0.00000	0.01530	0.01552	0.00000	0.00269	0.02171	0.00766	0.00137	0.00196
7	PIHR7	0.00000	0.00887	0.00765	0.03105	0.02042	0.00269	0.02171	0.00255	0.00137	0.00391
8	PIHR8	0.00000	0.00000	0.00765	0.03105	0.04083	0.00539	0.02171	0.00511	0.00000	0.00586
9	PIHR9	0.00000	0.00887	0.00000	0.01552	0.04083	0.00000	0.02171	0.00511	0.00000	0.00000
10	PIHR10	0.00000	0.00000	0.00765	0.00000	0.02042	0.00000	0.01085	0.00255	0.00000	0.00196

Table 10. Summary of the closeness ratio and ranking

		d_i^+	d_i^-	CC_i	Rank
1	PIHR1	0.00007	0.00361	0.979944	1 st
2	PIHR2	0.00294	0.00031	0.095544	9 th
3	PIHR3	0.00113	0.00106	0.485021	5 th
4	PIHR4	0.00155	0.00076	0.328101	6 th
5	PIHR5	0.00360	0.00007	0.018448	10 th
6	PIHR6	0.00227	0.00102	0.309826	7 th
7	PIHR7	0.00061	0.00202	0.767207	4 th
8	PIHR8	0.00039	0.00325	0.893043	2 nd
9	PIHR9	0.00066	0.00248	0.789587	3 rd
10	PIHR10	0.00198	0.00060	0.233531	8 th

4.0 requires skilled employees who can understand the applications. Moreover, those jobs which are automated does not require more people for work especially for those jobs that require lower qualification. The argument is supported by several authors (Kang et al., 2016; Wright & Schultz, 2018; Horvath & Szabo, 2019; Margherita & Braccini, 2021) in their respective studies. The second perceived impediment to HR is unemployment which is also very close to the first impediments but, the first impediments (job reduction) mainly focused on the lower-skilled jobs but, the unemployment is about the overall job market. The cause of such kind of unemployment is because of lack of higher-end technological skills among the job seekers. Several studies have highlighted the issue of unemployment in context to the implementation of new technologies (Kurt, 2019). Contradictory, the higher level of robotization under certain circumstances the unemployment will not increase (Popkova & Zmiyak, 2019). There are also arguments in favor of digitalization that it will bring more job opportunities to organizations (Ahammad et al., 2020). The third most important impediment found

Figure 2. Rank of the perceived impediments

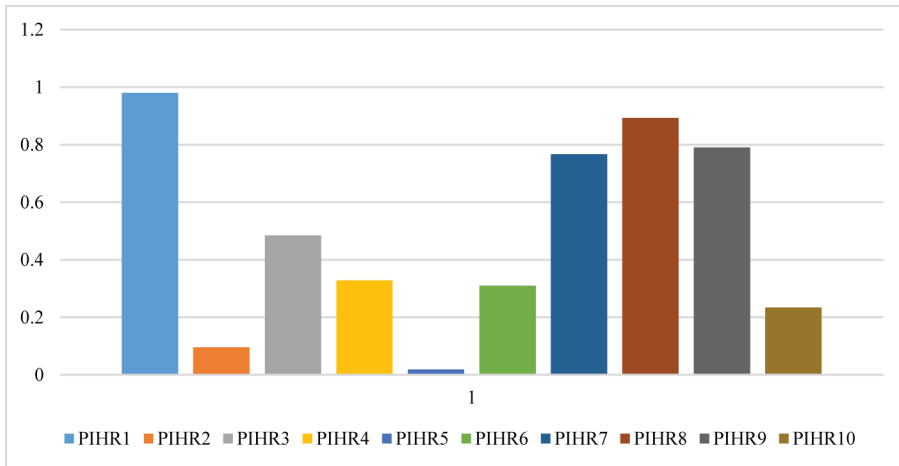


Table 11. The scores of the decision matrix and weight from different experts' suggestions

SN	Weight	0.15	0.1	0.1	0.2	0.2	0.03	0.15	0.03	0.02	0.02
	Anticipated solutions (AS)	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	Employee training (ASHR1)	5	3	5	3	3	4	3	4	5	4
2	Awareness about industry 4.0 (ASHR2)	3	3	4	3	4	3	3	5	5	4
3	AI and Data Analytics (ASHR3)	3	3	4	3	3	3	3	3	5	4
4	Smart HR 4.0 (ASHR4)	5	4	5	4	4	4	4	5	5	5
5	Knowledge Sharing Events (ASHR5)	4	4	5	5	4	4	3	5	5	5

Table 12. Normalized values of decision matrix

SN	AS	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	ASHR1	0.54554	0.39057	0.48337	0.36380	0.36927	0.49237	0.41603	0.40000	0.44721	0.40406
2	ASHR2	0.32733	0.39057	0.38669	0.36380	0.49237	0.36927	0.41603	0.50000	0.44721	0.40406
3	ASHR3	0.32733	0.39057	0.38669	0.36380	0.36927	0.36927	0.41603	0.30000	0.44721	0.40406
4	ASHR4	0.54554	0.52076	0.48337	0.48507	0.49237	0.49237	0.55470	0.50000	0.44721	0.50508
5	ASHR5	0.43644	0.52076	0.48337	0.60634	0.49237	0.49237	0.41603	0.50000	0.44721	0.50508

Table 13. Weighted values of decision matrix

SN	AS	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	ASHR1	0.08183	0.03906	0.04834	0.07276	0.07385	0.01477	0.06240	0.01200	0.00894	0.00808
2	ASHR2	0.04910	0.03906	0.03867	0.07276	0.09847	0.01108	0.06240	0.01500	0.00894	0.00808
3	ASHR3	0.04910	0.03906	0.03867	0.07276	0.07385	0.01108	0.06240	0.00900	0.00894	0.00808
4	ASHR4	0.08183	0.05208	0.04834	0.09701	0.09847	0.01477	0.08321	0.01500	0.00894	0.01010
5	ASHR5	0.06547	0.05208	0.04834	0.12127	0.09847	0.01477	0.06240	0.01500	0.00894	0.01010

Table 14. Positive and Negative ideal solution

	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
Positive ideal solution	0.08183	0.05208	0.04834	0.12127	0.09847	0.01477	0.08321	0.015	0.00894	0.01010
Negative ideal solution	0.04910	0.03906	0.03867	0.07276	0.07385	0.01107	0.06240	0.009	0.00894	0.00808

Table 15. Distance from the positive ideal solution (d_i^+)

SN	AS	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	ASHR1	0.00000	-0.01302	0.00000	-0.04851	-0.02462	0.00000	-0.02081	-0.00300	0.00000	-0.00202
2	ASHR2	-0.03273	-0.01302	-0.00967	-0.04851	0.00000	-0.00369	-0.02081	0.00000	0.00000	-0.00202
3	ASHR3	-0.03273	-0.01302	-0.00967	-0.04851	-0.02462	-0.00369	-0.02081	-0.00600	0.00000	-0.00202
4	ASHR4	0.00000	0.00000	0.00000	-0.02426	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	ASHR5	-0.01636	0.00000	0.00000	0.00000	0.00000	0.00000	-0.02081	0.00000	0.00000	0.00000

Table 16. Distance from the negative ideal solution (d_i^-)

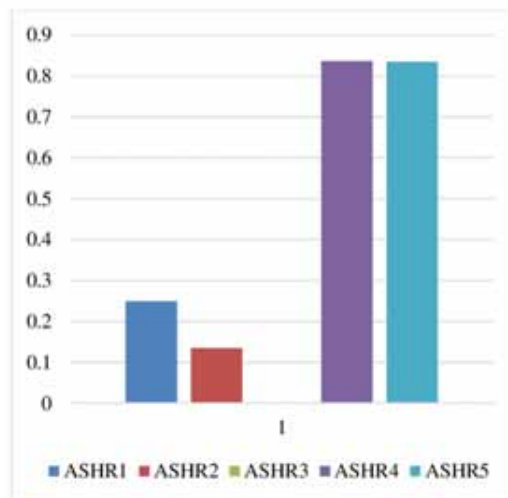
SN	AS	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	DM10
1	ASHR1	0.03273	0.00000	0.00967	0.00000	0.00000	0.00369	0.00000	0.00300	0.00000	0.00000
2	ASHR2	0.00000	0.00000	0.00000	0.00000	0.02462	0.00000	0.00000	0.00600	0.00000	0.00000
3	ASHR3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	ASHR4	0.03273	0.01302	0.00967	0.02425	0.02462	0.00369	0.02081	0.00600	0.00000	0.00202
5	ASHR5	0.01637	0.01302	0.00967	0.04851	0.02462	0.00369	0.00000	0.00600	0.00000	0.00202

in the study is “job insecurity” among existing employees. The required skills need to be learned and adopted by the employees to be in the organization. There is a thumb rule that if you learn as per the changes of the skill market the professional growth will be high. But, job insecurity will be there for employees who are not learning new skills as per the changes taking place in the organization (Nam, 2019; Agarwal et al., 2021). These issues apply to big organizations but it is more crucial for the SMEs because they already suffering from many challenges (financial and market-related

Table 17. Summary of the closeness ratio and ranking

		d_i^+	d_i^-	CC_i	Rank
1	ASHR1	0.00357	0.00119	0.24935	3 rd
2	ASHR2	0.00414	0.00064	0.13436	4 th
3	ASHR3	0.00478	0.00000	0.00000	5 th
4	ASHR4	0.00059	0.00302	0.83674	1 st
5	ASHR5	0.00070	0.00354	0.83491	2 nd

Figure 3. Rank of the anticipated solutions



problems) and the adoption of industry 4.0 can give an extra load to the organization. There is also a significant point to notice that the higher skilled employees (according to industry 4.0) will prefer to work with big organizations rather than SMEs. The last three (Rank 8 to Rank 10) significant perceived impediments were “challenges to trainers”, “replacements of the human workforce” and the “training cost”. The perceived impediments related to the trainers’ knowledge connotes that whether trainers are trained enough as per the requirements of industry 4.0 towards providing training to the employees (Agarwal et al., 2021). The replacement of the human workforce with machines is also one of the lower-order perceived impediments. Automation is an integral part of industry 4.0 and when there is more automation it will lead to the replacement of the workforce with advanced machines such as robots. The least order of the perceived impediments found is training cost. Although the training cost matters, a lot for the industrialist while implementing industry 4.0. But, the results of the present study suggest that the SMEs wanted to avoid the extra cost of the training, and hence, they prefer to hire trained employees rather than invest more in training. The trained new employees can also train the existing employees.

The topmost anticipated solution to the impediments to HR is “Smart HR4.0”. Smart HR4.0 is a dedicated HR system based on the new technologies used in industry 4.0 for the management of

employees and their skills. To cope with the HR challenges related to industry 4.0 is a promising and emerging concept (Sivathanu & Pillai, 2018). The second anticipated solution is the knowledge-sharing programs required for enhancing the skill set of the employees (Sriram & Vinodh, 2021). The next order solution is employee training which the SMEs have prioritized as the least order impediments in the study but they also consider that it is a fair solution to the HR impediments for enhancing the skills of the employee (Ahammad et al., 2020). The next lower level of solution is about the increasing awareness about industry 4.0 which is very important to avoid grapevine communication in the organization. It happens when employees are not aware of the distinct knowledge about the new concepts they become the victim of false information. The last solution found in the study is about the use of AI and data analytics but, interestingly the SMEs have not agreed that this is an important parameter for human resource development (HRD). Though the studies (Vrontis et al., 2021) confirm that these technologies can be helpful for the development of HR.

In the study, the most significant perceived impediment found in context to HR is job reduction. The job reduction impediments are found on the top impediments because it is directly related to the skills. If the skill gap will be available, job reduction will take place among the SMEs. Therefore, it is suggested that the firms should upskill their manpower and also ensure job retention while adopting new technologies (Rombaut & Guerr, 2020). The SMEs are not able to survive in the international market due to the lacuna in their technological capabilities (Singh & Kumar, 2019). Therefore, these SMEs must engage with new technological concepts, train employees, and adopt new methods. Indeed, the SMEs are mostly engaged in only operational activities but, the time has come where there is a need for advanced technologies to be implemented. (Coupe, 2019). There is a strong recommendation given in the study of Masood & Sonntag (2020) that if the SMEs especially those are engaged with manufacturing want to prosper in the future then they must adopt the concept of industry 4.0. In this way, these SMEs can compete in the national and international markets. Finally, as per the result of the study and the existing studies is important to incorporate the SmartHR 4.0 concepts to implement the concept of industry 4.0.

6. IMPLICATIONS FOR PRACTICE

The outcomes of the present study are useful for the managers working with SMEs especially those who are engaged or likely to adopt the concept of industry 4.0. As the study highlights the concern over HR requirements and their associated impediments in context to practicing industry 4.0 and the anticipated solutions which can be adopted to overcome the impediments. The managers can get the idea with these outcomes while forming a dedicated team of people to work on the industry 4.0 pattern. The study also highlights the usefulness of training methods as per the requirements of industry 4.0 for HR working in SMEs. Rapid industrialization and development are an imperative part of economic growth and it is a continuous process for nation-building. In this development process, it is important to maintain the man and machine relationship in a balanced way, which is utmost, required for socio-economic development. Hence, the research highlights to uplift the HR in the organization with the help of training and engaging with newer technologies rather than reducing or eliminating the workforce.

7. LIMITATIONS AND FUTURE RESEARCH SCOPE

This research work can be a significant piece of contribution in the field of industry 4.0 and HRM. The present research work may be helpful for the researchers towards adding further insights to this area of the research. Lack of SMEs in India those who are practicing industry 4.0 techniques and the data size are some of the possible limitations of the present research work. The readers of the articles or researchers can enhance it, as there is still a vast scope even after this research, which can be fulfilled.

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